Final

Site Investigation Report
Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7)

Fort McClellan
Calhoun County, Alabama

Prepared for:

U.S. Army Corps of Engineers, Mobile District
109 St. Joseph Street
Mobile, Alabama 36602

Prepared by:

IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923

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Table of Contents

Page

Table of Contents (Continued)

Page

List of Appendices

List of Tables

List of Figures

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK08, IT Corporation (IT) completed a site investigation (SI) at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI consisted of the sampling and analysis of nine surface soil samples, seven subsurface soil samples, and four groundwater samples. Four of the soil samples were collected from test pits that were excavated in the area of the trenches. In addition, four permanent groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of this investigation, IT incorporated data previously collected by QST Environmental, Inc. at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

The analytical results indicate that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and pesticides were detected in the various site media. In addition, two explosive compounds were detected in one groundwater sample. Polychlorinated biphenyls and herbicides were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for Fort McClellan. In addition, a streamlined risk assessment was performed to further characterize potential human health risk.

Because the site is projected for residential reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. In soils, with the exception of aluminum and iron in one sample each, the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values. Although the concentration of aluminum (25,800 milligrams per kilogram [mg/kg]) and iron (65,000 mg/kg) marginally exceeded their respective upper background ranges (24,600 and 56,300 mg/kg), the concentrations of these metals were within the same order of magnitude as background. These metals are common elements in native soils and are not believed to be related to historical operations conducted at the site. Therefore, the elevated levels of aluminum and iron are attributed to variations in naturally occurring background levels. VOC, SVOC, and pesticide concentrations in soils were below SSSLs.

In groundwater, several metals were detected in each of the monitoring wells at concentrations exceeding SSSLs and background concentrations. Thallium was identified at the primary metal of concern. However, the groundwater samples had high turbidity (ranging from 150 to 500 nephelometric turbidity units [NTU]) at the time of sample collection, which has been previously demonstrated in a groundwater resampling study conducted by IT at Fort McClellan to cause elevated metals concentrations.

Additionally, the concentrations of five organochlorine pesticides (particularly endrin aldehyde) exceeded their SSSLs in groundwater. Because the wells were grossly contaminated with sediment (up to 500 NTU), further supports the identification of low levels of organochlorine pesticides in groundwater. The pesticides have a chemical affinity for soils rich in clay minerals, particularly for the soils surrounding the wells at Parcel 154(7). Because organochlorine pesticides are generally immobile in soil, their presence in groundwater is most likely attributable to sediment contamination.

One explosive compound (2-amino-4,6-dinitrotoluene) was detected in one groundwater sample at a level (0.00028 milligrams per liter [mg/L]) exceeding its SSSL (0.0000936 mg/L). Although there is no U.S. Environmental Protection Agency established maximum contaminant level or health advisory value for this compound, the hazard index estimated from the SSSL is well below the threshold limit of 1, suggesting that adverse health effects are unlikely.

Several metals were detected in surface soils at concentrations exceeding ESVs. With the exception of iron, lead, and mercury in one sample each, and selenium in two samples, the metals that exceeded ESVs were below their respective background concentrations or within the range of background values. The elevated iron result was discussed previously and is attributed to variation in naturally occurring background levels. Lead (300 mg/kg) and mercury (0.81 mg/kg) exceeded their respective ESVs (50 and 0.1 mg/kg) and upper background ranges (83 and 0.32 mg/kg) in only one of nine samples each. All other lead and mercury results were below their respective background concentrations or within the range of background. One elevated lead and mercury result each is not representative of a nominal site-wide level. Furthermore, no area-specific "hot spots" of these metals were identified. Therefore, lead and mercury are not expected to pose a significant threat to ecological receptors. Selenium concentrations (2.04 and 2.27 mg/kg) exceeded the ESV (0.81 mg/kg) and upper background range (1.3 mg/kg) in two samples but were within the same order of magnitude as background. Therefore, the two elevated selenium concentrations are attributed to variations in naturally occurring background levels. Three VOCs (1,1,1-trichloroethane, tetrachloroethene, and trichlorethene) and two pesticides (4,4'-DDE and 4,4'-DDT) exceeded ESVs in surface soils. However, the levels of these chemicals were low (less than 0.2 mg/kg) and are not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC) located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE), Mobile District. The USACE contracted IT Corporation (IT) to provide environmental services for completion of the site investigation (SI) at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), under Contract Number DACA21-96-D-0018, Task Order CK08.

The U.S. Army Environmental Center (AEC) originally contracted QST Environmental, Inc. (QST) to perform the SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in the summer of 1998. QST collected soil samples and attempted the installation of four temporary monitoring wells using direct-push technology (DPT). However, groundwater was not encountered in the DPT borings and the wells were not installed. Therefore, the USACE contracted IT to install four permanent monitoring wells and to collect four groundwater samples.

This SI report summarizes field activities, including field sampling and analysis and monitoring well installation activities, and data compiled by IT and QST for the SI conducted at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

1.1 Project Description

The Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

Field work performed by IT during the SI was conducted in accordance with the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan. Sample locations and analytical parameters were specified in the QST work plan (QST, 1998).

The SI included field work to collect nine surface soil samples, seven subsurface soil samples, and four groundwater samples to determine if potential site-specific chemicals are present at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BCT will decide either to propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

The Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), is located in the west-central portion of the FTMC Main Post, in a wooded area immediately south of Littlebrant Drive (Figure 1-1). The ground scar was identified on aerial photographs taken in 1961 and 1964 (ESE, 1998). The parcel is a roughly rectangular area occupying approximately 4 acres (Figure 1-2).

Members of the EBS field team visited the ground scar area in 1998 and noted 11 sets of two trenches arranged end-to-end with a path between them. Each trench was uniformly shaped and measured approximately 3 feet wide by 12 feet long by 1 foot deep. Two 55-gallon drums, each standing upright and partially buried, were located within the trench area. The southern drum was equipped with an upright pipe that would discharge liquid into the other drum. The EBS field team speculated that this was a trench warfare training area; however, this has not been confirmed. A concrete slab is located approximately 80 feet west of the trenches and about 50 feet from Littlebrant Drive. No other information is available regarding operations at this site (ESE, 1998).

Site elevation ranges from approximately 880 feet above mean sea level (amsl) in the northeastern part of the site, to approximately 815 feet amsl in the southwestern portion of the parcel. An intermittent stream traverses the southern part of the site and flows to the west (Figure 1-2).

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present

FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Previous investigations to document site environmental conditions have not been conducted at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). Therefore, the site was classified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), including environmental sampling and analysis and groundwater monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), included the collection of surface soil samples, subsurface soil samples, and groundwater samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical aerial photographs of the site. The sample locations, media, and rationale are summarized in Table 3-1. Samples collected by IT are designated with the prefix "GSBP-154," and samples collected by QST are designated with the prefix "SI17." Sampling locations are shown on Figures 3-1 and 3-2. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

QST collected nine surface soil samples during the SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figures 3-1 and 3-2. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and location of trenches.

Sample Collection. Surface soil samples were collected from 0 to 1 foot below ground surface (bgs) with either a DPT sampling system or a stainless-steel hand auger in accordance with the QST work plan (QST, 1998). In addition, one sample was collected from the surface of one of two test pits that were excavated in the trench area. The test pits were excavated using a backhoe, and the soil samples were collected from the backhoe bucket using a stainless-steel spoon and bowl. The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.2 Subsurface Soil Sampling

QST collected a total of seven subsurface soil samples from four soil borings and two test pits at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), as shown on Figures 3-1 and 3-2. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil

PVC sump) was placed through the auger to the bottom of the borehole. The screen was attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 6 feet above the top of the well screen as the augers were removed. The well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the filter sand occurred inside the borehole. A bentonite seal, consisting of approximately 6 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The well was then grouted to ground surface. A locking well cap was placed on the PVC well casing. The well surface completion included placing a protective steel casing over the PVC riser and installing a concrete pad around the protective steel casing. Concrete-filled protective steel posts were placed around the well pad.

The wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units (NTU), for a maximum of 8 hours, or until the well had been pumped dry and allowed to recharge repeatedly. The well development logs are included in Appendix C.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the permanent wells installed by IT at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), on March 14, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. Measurements were referenced to the top of the well casing (Table 3-4).

3.1.5 Groundwater Sampling

IT collected groundwater samples from four monitoring wells at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). The well locations are shown on Figures 3-1 and 3-2. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

Sample Collection. Groundwater sample collection was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging was performed with a submersible pump equipped with Teflon™ tubing. Monitoring wells GSBP-154-MW01 and GSBP-154-MW04 were sampled using the submersible pump. Wells GSBP-154-MW02 and GSBP-154-MW03 were sampled using Teflon bailers because the wells were purged dry the preceding day. Field parameters were measured using a calibrated water-quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

IT sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a) and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

QST surveyed sample locations using global positioning system survey techniques or traditional surveying techniques described in the QST work plan (QST, 1998). Map coordinates for each sample location were determined using a Universal Transverse Mercator or State Planar grid to within ±3 feet (±1 meter). Horizontal coordinates are included in Appendix D.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on the potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for the samples collected at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), included:

- Target compound list volatile organic compounds (VOC) – EPA Method 8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000

- Polychlorinated biphenyls (PCB) – EPA Methods 8081A and 8082
- Chlorinated pesticides – EPA Method 8081A
- Chlorinated herbicides – EPA Methods 8150 and 8151A
- Nitroaromatic and nitramine explosives – EPA Method 8330
- Total organic carbon (TOC) – EPA Method 9060 (two subsurface soil samples only).

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable.

3.4 Sample Preservation, Packaging, and Shipping

IT preserved, packaged, and shipped samples following requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Table 5-1 of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed as specified in Section 4.13 of the SAP (IT, 2000a). Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in Knoxville, Tennessee.

QST preserved, packaged, and shipped samples following guidelines specified in the QST work plan (QST, 1998).

3.5 Investigation-Derived Waste Management and Disposal

IT Investigation-Derived Waste. IT investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), was segregated as follows:

- Drill cuttings
- Purge water from well development, sampling activities, and decontamination fluids
- Spent well materials and personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure (TCLP) analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

QST Investigation-Derived Waste. QST-generated IDW was managed and disposed as outlined in the QST work plan (QST, 1998).

3.6 Variances/Nonconformances

Neither IT nor QST documented any variances or nonconformances during completion of the SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

3.7 Data Quality

IT Data. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms. A summary of validated analytical data is included in Appendix E. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F includes a data validation summary report that discusses the results of the IT data validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System (ITEMS™) database for tracking and reporting.

QST Data. QST data were submitted to the Installation Restoration Data Management Information System (IRDMIS) database at the conclusion of SI field activities. Hard-copy data packages were sent to the AEC in Edgewood, Maryland, for storage. IT retrieved the electronic data via IRDMIS and the original data packages from the AEC for evaluation. From the IRDMIS data, IT was able to identify the key fields of information and translate the data into the ITEMS database.

The field sample analytical data are presented in tabular form in Appendix E. QST hard-copy analytical data packages were validated during a complete (100 percent) Level III data validation effort. Appendix F includes a data validation summary report that discusses the results of the QST data validation. Selected results were rejected or qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the data validation report. In addition, during the validation the electronic results were compared to the hard-copy results. Concentrations in the database were corrected where necessary and validation qualifiers added to the QST data using ITEMS to reflect the findings summarized in the QST data validation report.

After the QST data validation was complete and the results were updated, the QST and IT data were merged using ITEMS for inclusion in this SI report. The validated data were used in the comparisons to the SSSLs and ESVs developed by IT. The IT and QST data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), provided soil, geologic, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum

(Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites and limestones, and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded "window," or "fenster," in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

The soils mapped at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), consist of Anniston and Allen gravelly loam, 6 to 10 percent slopes, eroded (AcC2), and Anniston and Allen gravelly clay loam, 10 to 15 percent slopes, eroded (AbD3). The Anniston and Allen series of soils (which are mapped together as undifferentiated) consist of deep, well drained, strongly acidic, friable soils that formed in old local alluvium that washed from adjacent, higher-lying Linker, Muskingum, Enders, and Montevallo soils. In turn, these soils developed from weathered sandstone, shale, and quartzite. The texture of the subsoil ranges from light clay loam to clay or silty clay loam. Sandstone and quartzite gravel and cobbles are found throughout the soil (U.S. Department of Agriculture, 1961).

The Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), is situated immediately east of the Jacksonville Fault. Bedrock beneath the site is mapped as Cambrian Shady Dolomite. The area immediately west of the site (west of the Jacksonville Fault) is underlain by the Cambrian Conasauga Formation. Less than one mile to the north and east, the area is underlain by Mississippian/Ordovician Floyd and Athens Shale, undifferentiated. Figure 4-1 is a site geologic map showing the bedrock units in the vicinity of the site.

Residuum consisting predominantly of silt was encountered during hollow-stem auger drilling and ranged from approximately 20 to 50 feet bgs. A silt/clay soil mixture predominated below the silt unit. The borings ranged in depth from 90 to 100 feet bgs. Bedrock was not encountered during drilling.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (National Oceanic and Atmospheric Administration, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Surface runoff at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), follows the general topography and flows west-southwest towards the intermittent stream that flows westerly across the southern tip of the parcel.

4.2.2 Hydrogeology

On March 14, 2000, static groundwater levels were measured in the four permanent wells installed by IT at the site (as summarized in Table 3-4). Based on a base-wide groundwater flow map, groundwater flow at the site is generally to the west-northwest (Figure 4-2).

During soil boring and well installation activities, groundwater was encountered in residuum at depths ranging from 78 to 95 feet bgs. The static groundwater levels measured in the monitoring wells (Table 3-4) were approximately 6 to 25 feet above the depth-to-water data from the corresponding boring logs (Appendix B). This indicates that the groundwater has an upward hydraulic gradient and is under semiconfined conditions.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), indicate that metals, VOCs, SVOCs, and pesticides were detected in the various site media. In addition, two explosive compounds were detected in one groundwater sample. Herbicides and PCBs were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Summary statistics for background metals samples collected at FTMC are included in Appendix G.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit (RL) of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has an RL of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower RL, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when quantifying samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered, and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 through 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface Soil Analytical Results

Nine surface soil samples were collected for chemical analysis at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figures 3-1 and 3-2. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

Metals. Twenty-one metals were detected in surface soil samples collected at the site. The concentrations of six metals (aluminum, arsenic, chromium, iron, thallium, and vanadium) exceeded their SSSLs. Of these metals, arsenic, chromium, iron, and vanadium also exceeded their respective background concentrations in three samples each. With the exception of one iron result, these metals concentrations were within the range of background values established by SAIC (1998) (Appendix G). The iron result (65,000 mg/kg) in sample SI17-SS06 exceeded the range of background iron values (2,510 to 56,300 mg/kg).

The concentrations of twelve metals (aluminum, arsenic, barium, chromium, iron, lead, manganese, mercury, selenium, thallium, vanadium, and zinc) exceeded ESVs. Of these metals, arsenic (three samples), barium (one sample), chromium (four samples), iron (three samples), lead (one sample), mercury (two samples), selenium (four samples), vanadium (three samples), and zinc (one sample) also exceeded their respective background concentrations. With the exception of iron, mercury, and lead in one sample each, and selenium (two samples), these metals results were within the range of background values.

Volatile Organic Compounds. Fourteen VOCs were detected in surface soil samples collected at the site. VOC concentrations in the surface soil samples ranged from 0.00056 to 0.62 mg/kg. VOC concentrations in surface soils were below SSSLs. The concentrations of 1,1,1-trichloroethane (SI17-SS04), tetrachloroethene (PCE) (all locations), and trichloroethene (TCE) (all locations) exceeded ESVs. The PCE/TCE and 1,1,1-trichloroethane concentrations ranged from 0.0052 to 0.11 mg/kg.

Semivolatile Organic Compounds. Five SVOCs, including three polynuclear aromatic hydrocarbon (PAH) compounds (fluoranthene, phenanthrene, and pyrene), were detected in surface soil samples collected at the site. Each of the detected SVOCs was present in the sample SI17-SS07. Bis(2-ethylhexyl)phthalate and/or di-n-butyl phthalate (common sample contaminants) were the only detected SVOCs at the remaining surface soil sample locations. SVOC concentrations in surface soils were below SSSLs and ESVs.

Pesticides. A total of three pesticides (4,4'-dichlorodiphenyldichloroethane [DDD], 4,4'-dichlorodiphenyldichloroethene [DDE], and 4,4'-dichlorodiphenyltrichloroethane [DDT]), were detected in two of the surface soil samples collected at the site. Pesticides were not detected at the remaining surface soil sample locations. The pesticide results were flagged with a "J" data qualifier indicating that the compounds were positively identified but the concentrations were estimated. The pesticide concentrations were below SSSLs. Two pesticides were detected at concentrations exceeding ESVs in one sample each: 4,4'-DDE (SI17-SS07) and 4,4'-DDT (SI17-SS06).

Explosives. Explosive compounds were not detected in surface soil at the site.

5.2 Subsurface Soil Analytical Results

Seven subsurface soil samples (four from soil borings and three from excavated test pits located in the trench area) were collected for chemical analysis at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figures 3-1 and 3-2. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-2.

Metals. Twenty-three metals were detected in subsurface soil samples collected at the site. The concentrations of five metals (aluminum, arsenic, chromium, iron, and thallium) exceeded SSSLs. With the exception of aluminum in two samples (SI17-SS01 and SI17-SS04), the concentrations of these metals were below their respective background concentrations. One of the aluminum results (15,500 mg/kg) was within the range of background (1,690 to 24,600 mg/kg); the other aluminum result (25,800 mg/kg) exceeded the upper background range.

Volatile Organic Compounds. Thirteen VOCs were detected in subsurface soil samples collected at the site. VOC concentrations in the subsurface soil samples ranged from 0.00057 to 0.089 mg/kg. The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. Di-n-butyl phthalate and bis(2-ethylhexyl)phthalate were detected in subsurface soil samples at concentrations below SSSLs.

Pesticides. One pesticide (endrin aldehyde) was detected in one sample (SI17-SS02B) at a concentration below its SSSL. The result was flagged with a "UJ," indicating that the compound was not detected above the reporting limit. However, review of supporting QC data indicated that the compound was positively identified but at an estimated concentration.

Explosives. Explosive compounds were not detected in subsurface soil at the site.

Total Organic Carbon. Two of the subsurface soil samples (17-SS01B and 17-SS03B) were analyzed for TOC content. TOC concentrations in the samples were 3,410 and 3,130 mg/kg, as shown in Table 5-2 and summarized in Appendix E.

5.3 Groundwater Analytical Results

Groundwater samples were collected from four permanent monitoring wells at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), at the locations shown on Figures 3-1 and 3-2. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

Metals. Nineteen metals were detected in groundwater samples collected at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7). Several metals were detected in the groundwater samples at concentrations exceeding SSSLs and background concentrations. Each of the groundwater samples had high turbidity (ranging from approximately 150 to 500 NTUs) at the time of sample collection, which likely caused the elevated metals analytical results. The effect of high turbidity on metals concentrations in groundwater has been previously demonstrated in a groundwater resampling study conducted by IT at FTMC (IT, 2000c) (Appendix H).

Volatile Organic Compounds. Four VOCs (acetone, benzene, chloroform, and chloromethane) were detected in groundwater samples collected at the site. One acetone result and two chloromethane results were flagged with a "B" data qualifier, indicating that these compounds were also detected in an associated laboratory or field blank sample. The remaining results were flagged with a "J" data qualifier, indicating that the compounds were positively identified but their concentrations were estimated. VOC concentrations in groundwater were below SSSLs.

Semivolatile Organic Compounds. Di-n-butyl phthalate was detected in three groundwater samples at estimated concentrations below the SSSL. Phthalates are common sampling process contaminants.

Pesticides. Eleven pesticides were detected in groundwater samples collected at the site. Seven pesticides were detected at sample location GSBP-154-MW01, five each in GSBP-154-MW03 and GSBP-154-MW04, and one in GSBP-154-MW02. The analytical results were flagged with a "J" data qualifier, indicating that the compounds were positively identified but the concentrations were estimated. The pesticide concentrations ranged from 0.000014 to 0.00024 milligrams per liter (mg/L).

The concentrations of five pesticides exceeded SSSLs: aldrin (GSBP-154-MW02), dieldrin (GSBP-157-MW01), endrin aldehyde (two locations), heptachlor (two locations), and alpha-BHC (two locations).

Explosives. Two explosive compounds (2-amino-4,6-dinitrotoluene and 2-nitrotoluene) were detected in the groundwater sample collected from monitoring well GSBP-154-MW04. Explosives were not detected in any of the other groundwater samples. The concentration of 2-amino-4,6-dinitrotoluene (0.00028 mg/L) exceeded its SSSL (0.0000936 mg/L).

5.4 Streamlined Human Health Risk Assessment

A streamlined human health risk assessment (SRA) was performed for the Ground Scar at Littlebrant Drive, Parcel 154(7), using the SRA protocol established in the FTMC Installation-Wide Work Plan (IT, 1998). Appendix I contains a Technical Memorandum which briefly interprets the SRA developed for Parcel 154(7). The memorandum discusses the media of interest and data selection, site-chemical selection, chemicals of potential concern (COPC) selection, risk characterization, and conclusions.

SSSLs are based on the most highly exposed receptor (or receptor scenario) for each of several plausible uses for an individual site. For Parcel 154(7), the residential receptor scenario was selected. Media of interest for Parcel 154(7) included surface soil, subsurface soil, and groundwater. The samples utilized to determine the COPC for each receptor and medium are presented in the supporting tables located in Appendix I. COPC were selected from the site-related chemicals identified in the previous sections. Chemicals that were identified as not being site-related are not considered further since their presence is not attributed to site activities. COPC are medium- and receptor-specific chemicals that may contribute significantly to cancer risk (incremental lifetime cancer risk [ILCR] greater than or equal to 1E-6) or noncancer hazard (hazard index [HI] greater than or equal to the threshold level of 1). The COPCs were selected by comparing the maximum detected concentration (MDC) of the site-related chemical with the appropriate SSSL.

Source-term concentrations (STC) were estimated for the COPCs as described in the installation-wide work plan (IT, 1998). Briefly, data sets consisting of five or more samples are tested to determine the nature of the data distribution (normal, lognormal, or nonparametric). An upper confidence limit (UCL) on the arithmetic mean is estimated using the appropriate protocol for the data distribution. The UCL is generally selected as the STC, unless the UCL is above the range of detected concentrations, in which case the MDC is selected as the STC. The STC is considered a conservative estimate of average concentration to which a receptor may be exposed, and is the appropriate value to use to estimate cancer risk and noncancer hazard.

ILCRs and HIs were estimated for each receptor and medium for which a COPC was selected. ILCRs and HIs were summed across COPC to obtain total ILCR and total HI for each receptor and medium. ILCRs and HIs were also summed across all media to estimate a total ILCR and a total HI for each receptor.

SRA Conclusions. Thallium in groundwater emerged as the only significant COC at Parcel 154(7). Thallium was also detected at low levels in the soil at Parcel 154(7) (see Appendix I, Tables 2 and 5). The identification of thallium in groundwater reflects contamination of the water with sediment from the surrounding soil rather than a site-related chemical release. This assumption is supported by turbidity readings at the time of sampling ranging from 150 to 500 NTUs in the four wells. Readings above 10 NTU are generally interpreted as reflecting contamination with sediment, and it appears that the wells at Parcel 154(7) were grossly contaminated. This is further supported by the identification of low levels of several organochlorine pesticides in groundwater (see Appendix I, Table 9). Organochlorine pesticides have a high chemical affinity for soil, particularly for soil containing a high proportion of clay minerals such as surrounds the wells at Parcel 154(7). Because organochlorine pesticides are generally immobile in soil, their presence in groundwater suggests contamination with sediment.

In summary, it was concluded that exposure to surface soil or total soil at Parcel 154(7) is unlikely to yield unacceptable risks to human health. Thallium appears to be present in groundwater at levels of concern regarding human health, but further evaluation suggests that thallium concentrations are near background levels and that contamination of groundwater samples with sediment is the most likely explanation for the levels measured.

6.0 Summary, Conclusions, and Recommendations

Under contract to the USACE, IT completed an SI at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI consisted of the sampling and analysis of nine surface soil samples, seven subsurface soil samples, and four groundwater samples. Four of the soil samples were collected from test pits that were excavated in the area of the trenches. In addition, four permanent groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information. As part of this investigation, IT incorporated data previously collected by QST Environmental, Inc. at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

The analytical results indicate that metals, VOCs, SVOCs, and pesticides were detected in the various site media. In addition, two explosive compounds were detected in one groundwater sample. Polychlorinated biphenyls and herbicides were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health SSSLs, ESVs, and background screening values for FTMC. In addition, a streamlined risk assessment was performed to further characterize potential human health risk.

Because the site is projected for residential reuse, the analytical data were screened against residential human health SSSLs to evaluate the site for unrestricted land reuse. In soils, with the exception of aluminum and iron in one sample each, the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values. Although the concentration of aluminum (25,800 mg/kg) and iron (65,000 mg/kg) marginally exceeded their respective upper background ranges (24,600 and 56,300 mg/kg), the concentrations of these metals were within the same order of magnitude as background. These metals are common elements in native soils and are not believed to be related to historical operations conducted at the site. Therefore, the elevated levels of aluminum and iron are attributed to variations in naturally occurring background levels. VOC, SVOC, and pesticide concentrations in soils were below SSSLs.

In groundwater, several metals were detected in each of the monitoring wells at concentrations exceeding SSSLs and background concentrations. Thallium was identified at the primary metal of concern. However, the groundwater samples had high turbidity (ranging from 150 to 500 NTUs) at the time of sample collection, which has been previously demonstrated in a groundwater resampling study conducted by IT at FTMC to cause elevated metals concentrations.

Additionally, the concentrations of five organochlorine pesticides (particularly endrin aldehyde) exceeded their SSSLs in groundwater. Because the wells were grossly contaminated with sediment (up to 500 NTU), further supports the identification of low levels of organochlorine pesticides in groundwater. The pesticides have a chemical affinity for soils rich in clay minerals, particularly for the soils surrounding the wells at Parcel 154(7). Because organochlorine pesticides are generally immobile in soil, their presence in groundwater is most likely attributable to sediment contamination.

One explosive compound (2-amino-4,6-dinitrotoluene) was detected in one groundwater sample at a level (0.00028 mg/L) exceeding its SSSL (0.0000936 mg/L). Although there is no EPA established maximum contaminant level or health advisory value for this compound, the hazard index estimated from the SSSL is well below the threshold limit of 1, suggesting that adverse health effects are unlikely.

Several metals were detected in surface soils at concentrations exceeding ESVs. With the exception of iron, lead, and mercury in one sample each, and selenium in two samples, the metals that exceeded ESVs were below their respective background concentrations or within the range of background values. The elevated iron result was discussed previously and is attributed to variation in naturally occurring background levels. Lead (300 mg/kg) and mercury (0.81 mg/kg) exceeded their respective ESVs (50 and 0.1 mg/kg) and upper background ranges (83 and 0.32 mg/kg) in only one of nine samples each. All other lead and mercury results were below their respective background concentrations or within the range of background. One elevated lead and mercury result each is not representative of a nominal site-wide level. Furthermore, no area-specific "hot spots" of these metals were identified. Therefore, lead and mercury are not expected to pose a significant threat to ecological receptors. Selenium concentrations (2.04 and 2.27 mg/kg) exceeded the ESV (0.81 mg/kg) and upper background range (1.3 mg/kg) in two samples but were within the same order of magnitude as background. Therefore, the two elevated selenium concentrations are attributed to variations in naturally occurring background levels. Three VOCs (1,1,1-trichloroethane, tetrachloroethene, and trichloroethene) and two pesticides (4,4'-DDE and 4,4'-DDT) exceeded ESVs in surface soils. However, the levels of these chemicals were low (less than 0.2 mg/kg) and are not expected to pose a significant threat to ecological receptors.

Based on the results of the SI, past operations at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar with Trenches at Littlebrant Drive, Parcel 154(7).

7.0 References

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